

## Viewing the Milky Way Through Space and Time: A Proposed Herschel Far-IR/Submm Survey of the Galactic Plane

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A 60–600 micron 5 band, 4–40" diffraction limited beam FWHM, photometric imaging survey with Herschel of ~1500 square degrees along the galactic plane, will be a very ambitious Herschel Key-Project with a promise of breakthroughs in many fields of galactic astronomy. It will also provide the community with a publicly available, homogeneous and calibrated dataset of extraordinary legacy value for decades to come. From diffuse interstellar cirrus to dense atomic and molecular clouds, from protostellar to post-AGB envelopes, from supershells to supernovae remnants, the equatorial plane of our galaxy provides the ideal laboratory to carry out investigations of the global and integrated properties of the different phases of the galactic ISM, its evolution and interactions. Further, results from the last generation of infrared observatories demonstrate that the warm and cold dust component is not only the main contributor to the overall energy budget of galaxies, but a most important and effective tracer of the structural, physical and evolutionary conditions of the material throughout the whole life-cycle of a galaxy. The Herschel satellite offers the optimum and unique combination of spectral coverage, spatial resolution, and sensitivity to efficiently survey the entire galactic plane in the far-infrared and submillimeter. Such a survey, when combined with complimentary atomic and molecular gas surveys, will provide the definitive and statistically significant measurements of the properties of both the gas and the dust component of the ISM. This dataset is uniquely capable of addressing important and fundamental issues such as: what are the timescales for cloud formation and their evolution (e.g., transition from atomic to molecular clouds)? What is the history of star formation in the Milky Way? What is the star-formation efficiency and its variation with galactocentric radius and environment? What is the life-cycle of dust, and how or why do dust properties evolve? What, if any, are the conditions for triggering star formation and what is the relative importance of sequential vs. induced star formation? What is the timeline for the formation of massive stars? What are the variations in the gas and dust ratio, and what factors govern these variations?